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Modern Approaches to Unifying Compensatory and Legal Mechanisms in the Process of Forming a Legal Category of "Ecological Damage"

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Abstract

The armed aggression of the Russian Federation has caused systemic environmental damage to the territory of Ukraine, which requires the formation of unified compensatory and legal mechanisms consistent with international and European standards. The article analyses modern approaches to the legal qualification of environmental damage, its assessment, and compensation in the national legislation of Ukraine in order to develop a comprehensive mechanism of legal response to challenges of war. The research is aimed at analysing the legal nature of environmental damage in the context of military conflict and substantiating approaches to its compensation in the context of post-war recovery and ecosystem sustainability. The research methodology is based on a combination of content analysis of international treaties, EU acquis norms, Ukrainian legislation, case law (the International Court of Justice (ICJ), the United Nations Compensation Commission (UNCC), and the European Court of Human Rights (ECHR), as well as a systematic review of scientific publications in Google Scholar. The practical base of the study is supplemented by analysing the case of destroying the Kakhovka hydroelectric power plant (HPP), official data of the State Environmental Inspectorate (SEI), and reports of intergovernmental organizations. The need for transition from a normative-calculation to an expenditure-recovery model of assessment, the implementation of the Planetary Boundaries principles, in addition to the introduction of a national mechanism for monitoring losses, has been argued.

Keywords

Legal liability; Environmental safety; Ecosystem services; Environmental rights and interests; Planetary Boundaries; Ecosystem restoration

Introduction

The issue of seeking damages caused to the environment by the armed conflict has acquired a new interpretation in light of the Russian-Ukrainian war, which has been going on since 2014 and has particularly escalated after the full-scale invasion in 2022. Damage to natural ecosystems as a result of hostilities leads not only to the loss of biological and landscape diversity but also to the destruction of natural food chains and disruption of ecosystem balance, which, in turn, negatively affects the health of the population, the state of the environment, and the genetic potential of the Ukrainian people. Such processes are accompanied by large-scale migration waves, socio-economic instability, and the formation of long-term hazards to public health.

To confirm the above statement, the environmental disaster caused by the explosion of the Kakhovka HPP on 6 June 2023 should be ascertained. Large-scale flooding led to the death of aquatic organisms, eutrophication, and water pollution. Within the first week, waters mixed with organic matter and toxins reached the coast of the Odesa region, further penetrating the Black Sea, covering an area of more than 7,300 square kilometres (km^2) and affecting the coastal ecosystems of Turkey, Bulgaria, and Romania (SI "USCME," 2025). In addition, more than 80% of protected areas were affected in the flood zone, some of which are integrated into the Emerald Network of Europe. Meanwhile, large-scale forest fires were recorded in eastern Ukraine, in particular in the Holy Mountain National Park, which damaged or destroyed four-fifths of almost 12,000 hectares of forest, eventually making it impossible to absorb at least 9 million (mln) tonnes of carbon dioxide (CO_2). According to the estimates of the non-governmental Initiative on Greenhouse Gas Accounting of War (IGGAW), during the three years of a full-scale war, total greenhouse gas emissions in Ukraine have exceeded 230 mln tonnes of CO_2-equivalent, which corresponds to the annual emissions of four European countries such as: Austria, Hungary, the Czech Republic and Slovakia (Igini, 2025; Planetary Security Initiative, 2025; Frost, 2025). Thus, the environmental consequences of the regarded war are not limited to the territory of Ukraine, but rather trans-border and even global in nature, hence, creating challenges not only for national, but also international environmental law.

As of July 2025, according to the official data of the Stockholm Environment Institute (SEI), more than 9,000 facts of environmental violations caused by the armed actions of the Russian Federation have been documented in Ukraine, with the total amount of damage inflicted – UAH 5.296 trillion (trn) (EcoZagroza, 2025). Of the specified, damage to atmospheric air accounts for UAH 812.79 billion (bn) (including the following: damage due to burning of oil products – UAH 172.62 bn, forest fires and other plantations – UAH 634.04 bn, emissions of pollutants into the air – UAH 9.49 mln, destruction – UAH 6.12 bn); land resources – UAH 1.24 trn (involving damage from land pollution – UAH 1.22 trn, soil pollution – UAH 20.89 bn); water resources – UAH 117.50 bn (included damage from polluting water bodies – UAH 64.74 bn, from clogging water bodies – UAH 9.76 bn, unauthorized water taken and/or used – UAH 34.97 bn, pollution of sea waters – UAH 8.03 bn).[1]

[1] These figures are the result of officially verified calculations carried out by the State Environmental Inspectorate (SEI) in accordance with approved methods (as of 20.07.2025).

Another confirmation of the relevance of the study is the initiation of international litigation with claims for compensation for environmental damage. Thus, Ukrhydroenergo has initiated the procedure of filing a lawsuit with the International Arbitration Court against the Russian Federation, seeking damages for destroying the Kakhovka HPP in the amount of about 2.5 bn US dollars ($) (Taranenko, 2023; Ukrinform, 2024). According to estimates of the Ministry of Environmental Protection and Natural Resources of Ukraine (MEPNRU), environmental damage from the aforementioned disaster accounts for UAH 146.4 bn. It should be stated that Ukrhydroenergo has also filed a lawsuit with the European Court of Human Rights against Russia, seeking damages caused as a result of Russia's unprovoked military aggression against Ukraine, which is not only about the Kakhovka HPP, but also about the unfinished wind farm on Zmiinyi island, with the total amount of losses under the lawsuit – UAH 17 bn.

Such examples demonstrate not only the scale of the environmental disaster but also the need for a drastic transformation of legal approaches to the definition, legal qualification, assessment, and compensation of damage caused to the environment. At the same time, it is worth noting that the concept of "environmental damage" still does not have a well-established definition in Ukrainian legislation. The existing system of compensation is based mainly on the Soviet approach to determining lesions at fixed rates, which does not allow for reflecting the full range of losses to the environment, in particular, those of ecosystem services, functions of natural systems, etc. Thus, Article (Art.) 69 of the Law of Ukraine (LoU) "On Environmental Protection" (hereunder the Law) (1991)[2] enshrines the concept of seeking damages caused as a result of "infringing the legislation on environmental protection" in full, including compensation for lost profits for the time required to restore health, the quality of the environment, and the reproduction of natural resources to a state suitable for their intended use. The considered compensatory approach is criticized by scientists, emphasizing the vagueness of the legal status of environmental damage, the complexity of its objective assessment, as well as the inability of existing approaches to cover such components as a violation of the ecosystem's balance or a decrease in the quality of life. Among the key comments are either noted the following: the uncertainty of environmental quality criteria, the inconsistency of economic mechanisms with international standards, and the lack of a comprehensive object composition of damage (Demydenko, 2024; Karnaukh, 2021; Sirant, 2020; Veklych, 2019). Therefore, at least one of the fundamental principles of law-making activity – the principle of legal certainty – is infringed.

It should also be highlighted that the current regulatory and calculation approaches are outdated in view of the fact that the former do not regard the loss of ecosystem functions, the effects of climatic changes, along with the intergenerational impact of ecosystem degradation. On the other hand, the damage caused to the environment should include not only direct material losses, but also long-term negative consequences for the environment, individual natural objects, disruption of ecosystem functioning, and loss of ecosystem services. Against the aforementioned background, the cost-recovery model

[2] Vidomosti Verkhovnoi Rady Ukrainy (VVRU) (1991). Law of Ukraine dated 25.06.1991 № 1264-XII "On Environmental Protection." Available at: https://zakon.rada.gov.ua/laws/show/1264-12#Text (accessed on 28 July 2025) (in Ukrainian).

of damage assessment, which provides for determining the cost of restoring resources to their basic state, taking into account the risks associated with degradation, reduction of biodiversity, and climate change, in addition to the loss of ecosystem services, is becoming increasingly relevant.

In world practice, there is a tendency to unify terminology, introduce an ecosystem approach, apply the concept of Planetary Boundaries, and develop effective monitoring as well as compensation mechanisms that take into consideration both the extraterritorial and intergenerational nature of damage (for instance, UNCC practice, ICJ decisions, CBD principles, European Directive 2004/35/EC[3] on liability for environmental damage). Moreover, the modern European Union (EU) law is increasingly focusing on integrating environmental and climate damage into a broader context of recovery, human rights, and sustainable development. In this context, it is exceedingly important to form a single categorical framework that will enable harmonizing national approaches to assessing damage and its compensation with the EU acquis as well as developing an effective compensation and legal mechanism that will ensure liability for ecological and legal torts, in particular in terms of an armed conflict.

In view of the above, the article aims to study modern approaches to the unification of compensation and legal mechanisms in the context of forming the legal category of "ecological damage," regarding the international obligations of Ukraine, the transformation of the national legal terminology system, the practice of post-war reconstruction, and the tasks of ensuring ecosystem sustainability. The chosen aim resulted in setting and solving the following tasks:

- to find out the content and essential characteristics of related legal categories such as "damage caused to the environment," "environmental damage," "damage caused to nature," etc.;
- to analyse and substantiate the ways of institutionalization of the legal institution of climate damage compensation in national legislation;
- to study the impact of the norms of European and international law on the environmental and legal doctrine as to interpreting the legal category of "ecological degradation" and peculiarities of its compensation;
- to streamline the object composition of environmental and compensation relationships;
- to develop recommendations for improving national environmental legislation.

Literature Review

The problem of determining and compensating environmental damage caused to the environment as a result of armed conflict is becoming more and more of a particular attention in both Ukrainian and international scientific literature. A systematic review of scientific publications in Google Scholar by keywords "ecological damage" and "ecological damage + war" for the 1990-2025 period confirms the dynamic growth of

[3] Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. *Official Journal of the European Union*, L 143, 56-75. Available at: https://eur-lex.europa.eu/eli/dir/2004/35/oj/eng (accessed on 25 July 2025).

scientific interest in the specified topic. While in 1990-1999, the corresponding requests were issued only 81 and 57 results respectively, in the last five-year timescale (specifically, 2020-2025), the figure reached 11,400 and 12,500 publications correspondingly. Such a dynamic reflects the intensification of interdisciplinary discourse at the intersection of environmental law, international humanitarian law, human rights, and environmental policy.

At the same time, the analysis of the English-language segment of Google Scholar indicates even higher activity in this area: by the keywords "ecological damage" and "ecological damage armed conflict," the number of publications for the same period amounts to 21,800 and 19,900 accordingly, which, in turn, confirms the international significance of the topic and its global scientific resonance. However, at the beginning of the twenty-first century, Ukrainian-language academic research on environmental damage, especially in the context of armed conflict, was limited. During the 1990-2009 period, only 138 relevant publications were identified, of which less than 10 were devoted to the issues of a compensation mechanism, thus indicating the fragmentation of legal approaches to environmental damage compensation in the doctrine of that time. The main attention of scientists in those days was focused on general theoretical and legal aspects, including the definition of "environmental damage," issues of tax liability, and analysis of international precedents related to the consequences of hostilities in the Persian Gulf, Yugoslavia, and Afghanistan. Particular attention should be paid to the works by Krasnova, who considered the issue of legal regulation of compensating environmental damage based on international and European environmental legislation, the principles of liability, and their implementation in the national legal system of Ukraine, thereby laying the doctrinal foundations of the National Institute for Environmental Responsibility (Krasnova, 2006; 2008).

At the same time, the English-language scientific space demonstrates a significantly higher level of academic activity in the study of environmental damage, including that caused by armed conflict. Over the same period, Google Scholar recorded about 21,800 and 20,300 publications for the keywords "ecological damage" and "ecological damage armed conflict" respectively, which indicates the early formation of an interdisciplinary discourse at the intersection of international humanitarian law, environmental security, and international environmental law. Various studies of that period manifest attempts to systematize legal norms and develop approaches to environmental protection during armed conflict. In particular, in the article *Green War: An Assessment of the Environmental Law of International Armed Conflict*, Schmitt (1997) conducted a comprehensive analysis of current international legal instruments, elucidating the existing legal gaps in the field of environmental protection during war. In turn, Tarasofsky (1993), in his publication *Legal Protection of the Environment during International Armed Conflict,* raised the question of limited mechanisms for effectively ensuring environmental safety in conflict situations, analysing the intersection of international humanitarian and environmental law. Furthermore, Schwartz (1998), in the article *Environmental Terrorism: Analysing the Concept* expanded the analytical framework, considering environmental damage as a form of terrorist influence, reflecting the growing attention to the purposeful destruction of ecosystems in conflict situations. It is also worth noting the United Nations Environmental Programme (UNEP) reviews, specifically, *The State of the Environment in Conflict Zones* (1999), which

initiated the practice of environmental assessment of post-conflict territories as well as the International Committee of the Red Cross (ICRC, 1992; 1996) analytical reports on applying the principle of proportionality and preventive measures in international humanitarian law in relation to the environment. All the above-mentioned publications have become a fundamental basis for further regulatory initiatives and judicial practice in the field of environmental protection in the context of hostilities.

Furthermore, the period from 2010 to 2019 was a turning point for the national environmental and legal doctrine in the study of environmental damage related to hostilities. Particular attention is paid to analytical works devoted to the assessment of environmental losses caused in the ATO zone as well as the normative-legal aspects of compensating damage in accordance with European approaches (Bakumov, 2019; Lisova, 2017; Poberezhna and Stanetsky, 2017). During the above period, there is a growing interest in conceptualizing ecocide as an international crime in Ukrainian legal science (Lykhova, 2012; Mokhonchuk, 2013; Turlova, 2016). The first interdisciplinary publications appear to examine the potential for applying EU standards together with the practice of international organizations – exceptionally, the Organisation for Security and Co-operation in Europe (OSCE), European Parliamentary Labour (EPL), UNEP – to the Ukrainian context.

It should be emphasized that since 2014, especially after the full-scale invasion of Ukraine by the Russian Federation in 2022, the scientific discourse has undergone a radical transformation. The topic of environmental damage caused by armed aggression has come to the fore in Ukrainian legal science (as already noted, the number of scientific works during the specified period exceeds the 11,000 threshold). Thus, there is a significant increase in the number of scientific publications devoted to recording environmental crimes and the liability of the aggressor state, using ecosystem damage indicators; seeking legal instruments for reparations; assessing greenhouse gas emissions and the restoration of destroyed ecosystems, as well as the prospects of international judicial protection. In the Ukrainian doctrine of environmental law, work on the aforementioned topic is particularly presented in the works of Baik *et al.* (2023), Filho *et al.* (2024), Getman (2020; 2021), Golovko (2024), Kirin, Gryshchak and Revyakina (2024), Krasnova (2010; 2013), Malysheva and Hurova (2024), Sirant (2020), Trofymchuk, Shevyakina and Tomchenko (2023), Yarmol *et al.* (2022), and others. Additionally, at the level of dissertation research, there are noticeable shifts in covering the subject of environmental damage compensation, particularly in the works by Reshetnyk (2005) (in the context of violating environmental rights of citizens), Basay (1996) (considered the issue of compensating damage caused by environmental offenses), Koshelenko (2018) (analysed the legal basis of legal liability for environmental damage under the legislation of Ukraine and the EU from the perspective of a comparative approach) and others. In the international discourse, Guerra, Araújo and de Oliveira Santos (2023), Rawtani *et al.* (2022), White (2023), and others joined the formation of the modern paradigm.

Summarizing the above, it should be noted that despite the growing number of publications, Ukrainian environmental and legal science has not yet developed a consistent approach to defining the concept of "environmental damage", its legal nature, limits of liability, and compensation criteria. The majority of scientific papers are still

focused on certain aspects as follows: pollutant emissions, soil degradation, and biodiversity loss, leaving out a comprehensive legal mechanism for assessing and compensating lesions. Definition uncertainty, lack of common approaches to accounting and assessing losses, instability of the legal framework, which often modifies in response to current challenges, as well as the gap between various sectoral acts, make proper enforcement difficult in terms of armed conflict and post-war reconstruction. The key challenge is the lack of a unified concept of a compensation mechanism that would meet the needs of modern Ukraine, along with international standards. Thus, further research on environmental damage in terms of armed conflict should take place in an interdisciplinary field, involving the tools of international law, the practice of compensation, mechanisms of reparations, and sustainable recovery. Only such an integrative model will allow laying the foundations of an efficient legal response to the military-ecological challenges of the present and the future.

Methodology

The study has a qualitative, doctrinal-analytical focus and is based on the combination of legal analysis methods with an interdisciplinary approach to assessing environmental damage in armed conflict. Desk-based legal research, content analysis of legal acts, international treaties, policies, court decisions, as well as case-based policy reviews and systematic interpretation of environmentally oriented concepts have been applied. The methodology also includes elements of policy-tracing, which makes it possible to trace the evolution of certain concepts (to specify, ecosystem responsibility, ecocide, and transboundary liability) in international law, as well as the impact of military conflict on transforming Ukrainian environmental policy. A considerable attention is drawn to indicators for assessing the loss of ecosystem services, regarded through the prism of the Conflict and Environment Observatory (CEOBS), the Organisation for Economic Co-operation and Development (OECD), and UNEP reports, as well as approaches used in Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC) reports.

The key element of the study is the content analysis of international treaties such as Directive 2004/35/EC (2004)[4], Convention on Civil Liability for Environmental Damage (1993)[5], Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (USEPA,1980), EU acquis acts, national legislation of Ukraine (including the Law and the subordinate acts) as well as the judicial practice of the ECHR, ICJ, and UNCC. The analysis of key institutional reports and recommendations, in particular those by the MEPNRU, the SEI, and environmental non-governmental organisations (NGOs), has also been carried out. The regulatory framework is supplemented by the analysis of not only formal acts, but also soft law tools, as follows: UN General

[4] Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. *Official Journal of the European Union*, L 143, 56-75. Available at: https://eur-lex.europa.eu/eli/dir/2004/35/oj/eng (accessed on 25 July 2025).

[5] Council of Europe (1993). Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment of 21 June 1993. *Lugano,* ETS No. 150. Available online at: https://tinyurl.com/ytedn34a (accessed on 25 July 2025).

Assembly resolutions, UNEP guidelines, positions of the ICRC, as well as the European Commission reports on the post-war reconstruction of Ukraine.

To identify leading scientific approaches to assessing and compensating for environmental damage, a systematic literature review of papers published on the Google Scholar platform was conducted. The analysis covers theories of ecosystem services, climatic responsibility, environmental security, and human rights in the context of armed conflict. The case study of the destroyed Kakhovka HPP was additionally used as an example of an ecosystem catastrophe with long-term consequences, which requires new approaches to monetization of losses and assessment of ecosystem functions. It should be noted that the study is based on a comparative analysis of the EU and Ukraine's legal systems, which renders it possible to identify differences in approaches to the definition, assessment, and compensation of environmental damage, specifically in cases related to armed conflict. The comparative approach collates not only regulatory approaches, but also law enforcement practice, including those in the framework of the activities of the UNCC, the ECHR, the EU Court of Justice, as well as the national courts of Ukraine.

Given the complexity of the studied phenomenon, the chosen methodology enables combining regulatory analysis, a comparative approach, along with elements of environmental assessment, for a comprehensive understanding of the problem of compensating environmental damage caused by war. Such interdisciplinary design of the study provides the opportunity not only to identify gaps in national and international regulation, but also to formulate recommendations for developing an effective model of environmental responsibility in the war and post-conflict period.

Ecological Damage: A Modern View of Conceptual Approaches to Forming a Legal Category

Before proceeding to the analysis of the theoretical and legal foundations of environmental damage, it should be outlined several key reservations which are of methodological and conceptual significance.

First, any attempt to quantify or qualitatively evaluate such damage is a priori incomplete, since it is not only about losing certain components of the environment, but about destroying an integral ecosystem – the foundation of human life and environmental well-being of the population. Damage caused to one of the ecosystem elements generates several interrelated consequences in all its other components, which, in turn, has the effect of a "chain reaction." It is worth adding that in the context of armed conflict, environmental hazards become complex and often unpredictable: destruction of natural ecosystems, loss of biological and landscape diversity, chemical and industrial pollution, destruction of large areas (in particular agricultural and forestry land), clogging of water bodies, uncontrolled fires, etc. predicting of which is complicated by their scale, duration, and synergistic effect. In the above stated context, the approach according to which armed conflict falls under the classification of psychological intervention seems reasonable, since these are acts of militancy caused by human activity, further leading to a significant deterioration of the environment and eventually resulting in various consequences for the environment and, thereby bringing to liability for non-compliance with international humanitarian law (Guerra and Sampaio, 2022).

Secondly, the scientific literature has repeatedly stressed that the assessment of environmental damage is complicated by several such factors: limited access to reliable, complete, and up-to-date information, the complexity of its processing in wartime, as well as the instability of environmental parameters in the biota-environment-human system (Antonyuk, 2023; Chernysh *et al.,* 2024; Solodan and Palamarchuk, 2024). These difficulties are compounded by limited access to contaminated areas, danger to experts due to the presence of mines, shelling, and destroyed environmental infrastructure. At the same time, Ukraine is gradually introducing institutional and digital solutions aimed at recording environmental damage and monitoring. To exemplify, the official EcoZagroza resource, administered by the MEPNRU, is filled in based on data collected by the SEI according to established methods, which serves as an interactive platform for displaying military and environmental threats and as an important source of environmental information for generating evidence and analytics at the national and international levels.

Thirdly, natural connections, functional unity, along constancy of the ecosystem do not have a clear monetary equivalent, hence, creating significant difficulties for legal qualification and assessment of environmental damage from the standpoint of the traditional approach to determining liability. Fourthly, in the current conditions of armed aggression, economic assessment of natural conditions, ecosystem services and functions, as well as natural resources, is becoming exceedingly relevant, in particular, to determine the scale of their degradation, loss of functions, and ability to self-repair. At the same time, in the pre-war period, the mechanisms for monetizing such services were not properly introduced in Ukraine; therefore, lacking initial data for prompt response. In modern conditions, it is necessary to optimize the procedure for conducting an economic assessment (monetization) of environmental services, consisting of consumer and non-consumer values, which will allow determining the scale of environmental losses more accurately.

Fifthly, it is recommended to proceed from the concept that environmental damage can be expressed not only in causing harm to the environment, but also to human life, health, their economic, moral, aesthetic, and spiritual needs. The specified approach corresponds to the concept of "environment as an element of human well-being" and requires taking into account the humanitarian and social dimension of the lesion. Sixthly, the long-term impact of environmental damage has demographic consequences such as deterioration of public health, acceleration of environmental migration processes, reduction of life expectancy, and that of the quality of reproductive potential, which directly threatens the gene pool of the Ukrainians. Such changes may not be noticeable in the short run, but have a multiplicative effect and call into question the strategic viability of the nation.

Returning to the problems caused by chain ecosystem disturbances, it should be emphasized that environmental damage has a multiplicative character in view of the fact that the negative impact extends not only to individual components of the environment, but also to the climate as a whole, the social environment, and the quality of life of the population. In this regard, it is reasonable to differentiate environmental damage by the nature of harm, particularly direct (imminent) harm caused to the environment and indirect (circumstantial) one affecting the life, health, and social well-being of a person.

Taking into account the complexity and multilevel nature of such impacts, it is proposed to bring the concept of "environmental damage" to a new conceptual level as a broad, multidimensional legal phenomenon that combines environmental, social, economic, and climatic consequences. This implies an updated approach to forming the object composition of environmental offenses, taking into consideration the types of damage caused to nature, prolonged in time, difficult to predict, and often irreversible. Thus, when developing theoretical, legal, and legislative principles of assessing and compensating for environmental damage, it is expedient to regard not only the immediate, but also the latent, cumulative consequences of the impact on public health, the state of the environment, climate stability, and social security. At the same time, it is important to comprehend that dividing into direct and indirect harm is conditional, as these phenomena are closely interconnected, correlate with each other, especially in terms of armed conflict, and often occur simultaneously. In particular, the damage caused to ecosystems may accelerate climate change, and given the aforementioned, the question already arises about accelerating climate change processes, further increasing anthropogenic hazards, which, in turn, actualizes the need to develop legal mechanisms for climate compensation – a new direction that is just beginning to form in international environmental policy. Unfortunately, there is presently no single, complete, and adequate model for assessing and compensating either environmental or climate damage, hence complicating law enforcement.

These problems are peculiarly acute in the context of Russian armed aggression against Ukraine, which has been causing catastrophic damage to the environment for over a decade. Military operations and hostilities, infrastructure destruction, mining of territories, and chemical pollution – all these create new environmental threats, difficult to predict in space and time. Therefore, to efficiently manage the balanced development of the dynamic system "human society – environment," it is of significance to take into account not only the natural and economic, but also the social components, which directly determine the adaptive potential of the affected communities and resistance to new environmental hazards.

Given the above, it is necessary to outline the legal framework, which forms the principles of liability for the environmental damage caused in terms of armed conflict. Ukrainian legislation contains several normative legal acts that directly or indirectly establishes the relevant principles, mechanisms, and tools. In particular, the fundamental concepts of environmental damage compensation are enshrined in the Constitution of Ukraine (No. 254k-96VR of 28 June 1996 (VVRU, 1996) as well as in the following *normative legal acts,* such as: Civil Code of Ukraine (CCU) (No. 435-IV of 16 January 2003 (VVRU, 2003a), Economic Code of Ukraine (No. 436-IV of 16 January 2003 (VVRU, 2003b); the *Laws of Ukraine* "On Ensuring the Rights and Freedoms of Citizens and the Legal Regime in the Temporarily Occupied Territory of Ukraine" (No. 1207-VII of 15 April 2014 (VVRU, 2014a), "On Sanctions" (No. 1644-VII of 14 August 2014 (VVRU, 2014b), "On the Legal Regime of Martial Status" (No. 389-VIII of 12 May 2015 (VVRU, 2015), and "On the Basic Principles of Compulsory Seizure of Property Rights of the Russian Federation and its Residents in Ukraine" (No. 326[6] of 20 March

[6] Resolution of the Cabinet of Ministers of Ukraine (CMU) dated 20.03.2022 No. 326 "On the Approval of the Procedure for Determining the Damage and Losses Caused to Ukraine as a Result of the Armed

2022 (VVRU, 2022a); the *Resolutions of the Cabinet of Ministers of Ukraine* (CMU) "On Ensuring the Protection of National Interests in Future Claims of the State of Ukraine in Connection with the Military Aggression of the Russian Federation" (No. 187[7] of 20 March 2022 (VVRU, 2022a) and "On the Approval of the Procedure for Determining the Damage and Losses Caused to Ukraine as a Result of the Armed Aggression of the Russian Federation" (No. 326 of 20 March 2022 (VVRU, 2022b) etc. In addition to the above, the environmental legislation stipulates special norms on compensation for damage caused by environmental offenses, namely: Art. 69 of the LoU "On Environmental Protection": Art. 107 of the Forest Code of Ukraine (No. 3852-XII of 21 January 1994 (VVRU, 1994a), Art. 67 of the Subsoil Code of Ukraine (No. 132/94-VR of 27 July 1994 (VVRU, 1994b), Art. 111 of the Water Code of Ukraine (No. 213/95-VR of 6 June 1995 (VVRU, 1995), Art. 156, 157 of the Land Code of Ukraine (No. 2768-III of 25 October 2001 (VVRU, 2001a), Art. 63 of the LoU "On Wildlife" (No. 2894-III of 13 December 2001 (VVRU, 2001b) etc.

As the above review manifests, the issue of compensation and indemnification for environmental damage is regulated by a wide range of legal acts. However, the key role in this context is played by the Law, the provisions of which form the conceptual framework of environmental responsibility. A detailed analysis of the content of the specified act reveals the multi-level nature of compensation mechanisms enshrined in various sections and articles of the law. It should be noted that in the Law,[8] compensation for damage caused by infringing the legislation on environmental protection is considered as follows: (1) the *basic principle* of environmental protection ("seeking damage caused by violation of the legislation on environmental protection" (paragraph (para.) 1 Art. 3); (2) *the environmental right of citizens of Ukraine* ("filing lawsuits against state bodies, enterprises, institutions, organizations, and citizens for compensation for damage caused to their health and property as a result of a negative impact on the environment" (para. j of Art. 9), "persons, suffered such damage, have the right to claim for indemnification for lost profits for the time required to restore health, the quality of the environment, and the reproduction of natural resources to a state suitable for their intended use" (Part (P.) 2 of Art. 69); (3) *the guarantee of environmental rights of citizens* ("compensating in accordance with the established procedure for seeking damage caused to the health and property of citizens as a result of infringing the legislation on environmental protection" (para. f of P. 1 of Art. 10); (4) *the obligation of citizens in the field of environmental protection* ("indemnifying damage caused by pollution and other negative impact on the environment" (para. f of P. 1 of Art. 12); (5) *the competence of the central executive body which implements the state policy of state supervision (control) in the field of environmental protection, rational use, reproduction and protection of natural resources* ("filing claims for compensating damages and losses caused to the state as a result of violating the legislation on

Aggression of the Russian Federation." (2022b). Available online at: https://zakon.rada.gov.ua/laws/show/326-2022-п (accessed on 28 July 2025) (in Ukrainian).

7 Resolution of the Cabinet of Ministers of Ukraine (CMU) dated 20.03.2022 No. 187 "On Ensuring the Protection of National Interests in Future Claims of the State of Ukraine in Connection with the Military Aggression of the Russian Federation." (2022a). Available at: https://zakon.rada.gov.ua/laws/show/187-2022-п (accessed on 28 July 2025) (in Ukrainian).

8 Vidomosti Verkhovnoi Rady Ukrainy (VVRU) (1991). Law of Ukraine dated 25.06.1991 № 1264-XII "On Environmental Protection." Available at: https://zakon.rada.gov.ua/laws/show/1264-12#Text (Accessed: 28 July 2025) (in Ukrainian).

environmental protection" (para. e of P. 1 of Art. 20-22); (6) *the powers of public organizations in the field of environmental protection* ("filing claims to the court for seeking damages caused as a result of infringement of the legislation on environmental protection, including to the health of citizens and property of public organizations" (para. i of Art. 21); (7) *the basis for the formation of environmental protection funds* ("...funds of the Autonomous Republic of Crimea (ARC) and local environmental protection funds are formed as part of the budget of the ARC and the corresponding local budget at the place of causing environmental damage at the expense of..." (P. 2 of Art. 47); (8) *the obligations of enterprises, institutions, organizations and citizens* ("indemnifying damage caused by them as a result of violating the legislation on environmental protection, in the manner and amount established by the legislation of Ukraine" (P. 4 of Art. 68). In addition, economic measures to ensure environmental protection include compensation in accordance with the established procedure for damages caused by infringement of the legislation on environmental protection (para. g of Art. 41 of the Law). The above provisions of the specified Law demonstrate a multi-vector approach to resolving issues of liability for environmental damage, covering both individual rights of citizens and the obligations of the state, business entities, and civil society institutions.

It is also worth noting that the law sets out various terminological constructions used to describe the legal consequences of causing damage to the environment, in particular "compensation for damage" (P. 5 of Art. 68, P. 1 and P. 3 of the Law) and "indemnification for damage" (Art. 50 of the CU, P. 4 of Art. 68, P. 4 of Art. 69 of the Law) as well as "compensation for losses" (para. e of P. 1 of Art. 202 of the Law). In domestic doctrine, as in judicial practice, these terms are often used as synonyms, but there are essential differences between the specified. Thus, the concept of "compensation" is usually interpreted as the recovery of monetary amounts from the guilty person (who caused damage), for instance, the aggressor country, in favour of the injured party in the order of liability. Instead, "compensation" is considered a form of material support provided to the applicant from the state or other extra-governmental budget (including international material assistance) in accordance with the budget allocations. This distinction is of significance when selecting legal tools in the context of armed conflict and post-war reconstruction. It also necessitates the development of coordinated mechanisms that combine elements of private law (indemnifying) and public law (compensatory) liability, taking into account the principles of environmental justice, solidarity, and intergenerational responsibility.

In this regard, the norm of P. 1 of Art. 69 of the Law is of key importance, according to which damage caused as a result of infringing the legislation on environmental protection (to be further discussed in more detail) is subject to compensation in full. It should be noted that the "full scope" means both compensation for damage and the reproduction of natural resources to a state suitable for their intended use, which is the position the authors adhere to in the future. As for the first aspect – the legal basis for compensation – it is primarily about cases of violation of the requirements of the current legislation on environmental protection. Such infringements constitute tort actions consisting in non-compliance with the norms of substantive law, which, in turn, shall be able to respond to modern challenges, in particular those related to military hazards, together with environmental consequences of armed aggression. At the same time, the "basic" liability is that for violating the legislation on environmental protection by persons guilty of infringing the rights of citizens

to an ecologically safe environment; environmental safety standards; procedures or failure to take into account the results of the environmental impact assessment and failure to comply with the conditions specified in the conclusion of the environmental impact assessment, etc.[9] Undoubtedly, other components of offenses are also provided, though for this study, the fact of correlation of the such legal categories as "environmental safety," "the right to a safe environment" with "environmental damage" as well as the peculiarities of their mutually determined impact on the formation of compensation mechanisms is of a particular importance. The establishment of their interconnection enables a deeper understanding of the essence and logic of building effective compensation mechanisms that should take into consideration both the amount of damage caused and the social significance of environmental rights.

It is important to highlight that individuals who have suffered environmental harm are entitled to seek compensation not only for actual damages but also for lost profits. This includes lost income associated with the time necessary to restore health, rehabilitate environmental quality, and reinstate natural resources to a condition suitable for their intended use. As the practice of the Supreme Court shows, claims for compensation of lost income (lost profits) shall confirm such income not to be abstract, but would actually have been received, and merely the defendant's illegal actions were the only and sufficient reason depriving the opportunity to acquire the one. To elucidate, the Resolution of the Grand Chamber of the Supreme Court of Ukraine of 30 May 2018 (Case No. 750/8676/15-ts)[10] established that only that lesion of the amount of income that could have actually been received is compensated in the form of lost profits. Filing a claim for compensating lost income (lost profit) imposes on the creditor the obligation to prove that the income (benefit) is not abstract, but the one that would actually have been paid to him. The plaintiff shall also prove the fact that he could and should have received certain income, and only the unlawful actions of the defendant became the sole and probable reason that deprived him of the opportunity to make a profit. The Supreme Court maintained a similar position in Case No. 910/19617/21 of 12 March 2024,[11] where the calculation of lost profits was justified based on actual costs, design productivity, and evidence confirming the impossibility of additional production due to an illegal decision of the authority.

Compensating damage is carried out voluntarily, in a claim procedure, or in court. In this area, the methods of seeking environmental damage have their own peculiarities. If the conventional legal methods of seeking such damage are natural (such as land reclamation, forest reproduction, etc.) and monetary (compensation for damage in full without taking into account the cadastral assessment of a natural resource), then, according to national environmental legislation, the latter (monetary) method is generally recognized and has practical use. Depending on the circumstances of the case and available methods, it is implemented through one of the following four main

[9] *See* Art. 68 of the LoU "On Environmental Protection" (dated 25.06.1991 № 1264-XII), Art. 33 of the LoU "On Atmospheric Air Protection" (dated 16.10.1992 № 2707-XII), Art. 64 of the LoU "On the Nature Reserve Fund of Ukraine" (dated 16.06.1992 № 2457-XII) etc.)"

[10] Resolution of the Grand Chamber of the Supreme Court dated 30.05.2018 in Case No. 750/8676/15-ts. Available at: https://tinyurl.com/mrxwx3xd (accessed on 29 July 2025) (in Ukrainian).

[11] Resolution of the Grand Chamber of the Supreme Court dated 12.03.2024 in Case No. 910/19617/21. *Unified State Register of Court Decisions.* Available at: https://zakononline.com.ua/court-decisions/show/118000827 (accessed on 29 July 2025) (in Ukrainian).

approaches: tax (based on state-established taxes for damage to natural objects); calculation (based on special formulas and methods approved by authorized bodies); expendable (taking into account the actual costs of restoration); normative (applying standard estimated loss ratios). At the same time, none of the listed methods is based on accounting and measuring/ evaluating the loss of ecosystem services, neglecting which reduces the effectiveness of compensation mechanisms and contradicts the principles of environmental management.

In light of the above, it is crucial to recognize that the environment constitutes a shared natural resource. Consequently, any harm inflicted upon it represents a detriment not only to individuals but to society and humanity as a whole. It is from this position that Ukraine has made attempts to introduce the concept of "Planetary Boundaries" into national policy and legislation so as to determine its own contribution to its implementation. The essence of the Concept lies in the limited global resources, recognizing the limits of permissible anthropogenic impact on the main global systems (such as climate, biosphere, nitrogen, and phosphorus cycles, etc.) and the need for coordinated efforts of all countries to reduce pressure on the environment, preserve natural areas, slow down the loss of biodiversity and protect climate stability. It should be noted that the specified Concept served as the basis for developing the Environmental Treaty of Ukraine (2024), which sets out the principles of State environmental responsibility in the global context and calls for a review of damage assessment and compensation mechanisms, considering the ecosystem approach.

In the provided context, it is necessary to deeply comprehend the nature of natural objects themselves, the specifics of their economic assessment, and the limits of renewability, which are key prerequisites for building modern compensation mechanisms. Natural objects as components of the environment are the product of nature itself, and not the result of human labour activity or that of purposeful public expenditure. Their quantity and quality are determined by the laws of nature, not by the mechanisms of production, hence leading to a fundamental limitation of human influence on the process of their formation and reproduction. In this regard, natural resources have no value (specifically, it mostly implies "natural (or natural resource) rent"), i.e., in the meaning of *'purely'* economic understanding, may not be a commodity; therefore, it is about "natural capital." From an economic point of view, "since the economic assessment of ecosystem goods/ services as natural goods – a specific ecological resource – means measuring the consumer value of such types of natural goods in monetary terms in addition to their economic assessment also taking into account the loss of consumer value of these types of natural goods in case of their deterioration or destruction as a result of the damage caused to the latter, eventually bringing to a weakening or termination of ecosystem services ability to generate economic benefits and contributions to human well-being" (Veklych, 2019, p.3). Consequently, scientists believe that "when determining the overall indicator of economic damage from deteriorating /destroying ecosystem services, its key parameter is precisely the monetary assessment of the loss of consumer value of ecosystem services based on an economic assessment of negative changes in their ability as producers of economic benefits to human well-being" (Ibid, p.5).

Given the above, it is crucial to take into consideration the physical nature of the main natural objects since they are spatially and territorially anchored, fixed, and cannot be moved in space, which, in turn, restricts the possibility of their full recovery in kind. In most cases, the point is about partial conditional restoration, which renders realistic in relation to objects with renewable potential (to exemplify, forests, reservoirs, and soils), which raises a logical question about what level of qualitative essential (determining) natural characteristics it is possible to restore the specified. The answer is partially enshrined by P. 2 of Art. 69 of the LoU "On Environmental Protection" (1991), stating that compensation for damage provides for the reproduction of natural resources to a state suitable for their intended use, which means that the object shall again meet the minimum functional requirements for implementing environmentally safe and socially significant activities related to its use.

At the same time, natural resources rarely have an exclusively monofunctional purpose, which in the vast majority of cases, perform a complex of ecosystem, social, and economic functions, defining their multifunctional nature and social value. Accordingly, the process of their restoration should take into account not only physical or economic characteristics, but also functional potential so as to ensure environmental safety, public welfare, and sustainable development. In this context, it is worth drawing attention to one more flawed aspect. As is known, when using natural immovable objects as a spatial-territorial basis, their boundaries remain unchanged, which under modern conditions (to be precise, temporary occupation of territories, mining, chemical pollution, etc.) will significantly affect the foundations of human life (sustainability of life), ecological well-being of the population, economic activities, etc. Thus, environmental damage becomes not only a factor of environmental degradation, but also a threat to the implementation of fundamental human rights, particularly the right to a safe environment for life and health.

The aforementioned provision is consistent with the approach, enshrined in P. 3 of Art. 5 of the Law.[12] where human life and health are explicitly determined as objects of legal protection in environmental law. Guaranteeing an ecologically safe environment for human life and health is either proclaimed as one of the fundamental principles of environmental protection (para. b of Art. 3 of the Law). More current legislation officially recognizes the environmental determinant as one of the key factors of health, along with individual, social, and economic ones. The relevant provision is contained in para. 6 of Art. 1 of the LoU "On the Public Health System," (VVRU, 2022b), although the legislation does not provide a legal definition of the concept of "environmental determinant." Such legal ambiguity contradicts the principles of a holistic approach to health care and human rights. It is expediently noted in the scientific literature that the gradual transition from environmental protection to one as a human life support system actualizes the need to recognize a person as a direct object of legal protection. If natural objects are subject to protection as elements of the environment, in relation to a person, the specified should be directed to their rights and legitimate interests within the framework of interaction with the environment. In this regard, some scientists suggest considering the protection of a person in his natural environment as the main goal of environmental law. However, such a position has not yet been widely recognized either

[12] Vidomosti Verkhovnoi Rady Ukrainy (VVRU) (1991). Law of Ukraine dated 25.06.1991 № 1264-XII "On Environmental Protection." Available at: https://zakon.rada.gov.ua/laws/show/1264-12#Text (accessed on 28 July 2025) (in Ukrainian).

in legal doctrine or in domestic legislation, and even in law enforcement practice (Balyuk, Kovalchuk, and Poznyak, 2022). To opinionize, the above-stated situation requires a doctrinal review in view of the fact that legal norms related to environmental safety and healthcare shall comply with the constitutional and legal doctrine, according to which human life and health, dignity, and security are the highest social values (Art. 3 of the CU).[13] Such an approach requires the integration of the ecosystem approach to environmental damage with the doctrine of human rights, in particular through the recognition of a person not only as a beneficiary, but also as an object of protection in the system of environmental law.

The specified is of particular importance in the context of the legal position of the Constitutional Court of Ukraine (CCU), according to which nature and human rights are considered inextricably linked. Thus, in para. 2.1 of the reasoning Part of the Decision of the CCU No. 6-p(II)/2021 of 16 September 2021, it is emphasized that "a person is a treasure of nature, from which the rights and freedoms inherent in a person by birth, i.e., those that are natural, originate." In this regard, the main responsibility of the state is to affirm and ensure human rights and freedoms, the implementation of which is associated not only with refraining from violations or disproportionate restrictions on human rights and freedoms, but also to take appropriate measures to provide the possibility of their full implementation by everyone under its jurisdiction; given the above, the legislator and other public authorities shall guarantee effective legal regulation that complies with constitutional principles and norms and create mechanisms indispensable for meeting the needs and interests of a person (para. 1, para. 3 of the reasoning Part of the Decision[14] of the CCU No. 2-rp/2016 of 1 June 2016. These provisions emphasize that environmental law may not neglect human dignity, and therefore, should be aimed at creating a safe environment as a condition for the implementation of rights and freedoms, including the right to life, health, housing, work, and environmental information. In this context, the thesis that humanity will be able to survive only if it rethinks its attitude to nature as the environment and the basis of its own existence seems to be valid.

For a comprehensive coverage of the raised issue, it should be elucidated that calculating environmental damage caused to natural resources and complexes, along with the above, should cover not only the level of losses incurred in monetary terms, but also funds for restoring their previous state, environmental services and functions performed by the mentioned. Given this, the mechanism of legal regulation of restoring natural resources in kind, ecosystems in general together with the functions they perform, disrupted as a result of Russian aggression against Ukraine, should be improved, which, assuredly, may be done through adopting appropriate programmes for their restoration or, even though Ukraine is not yet a member of the EU, still acquired the status of a candidate country, through working on the development and regulatory support of its own National Nature Restoration Plan in accordance with Regulation (EU) 2024/1991.[15] The specified is

[13] Vidomosti Verkhovnoi Rady Ukrainy (VVRU). (1996). Constitution of Ukraine: Law of Ukraine dated 28.06.1996 No. 254k-96VR. No. 30 Art. 141. Available at: https://zakon.rada.gov.ua/laws/show/254к/96-вр#Text (accessed on 28 July 2025) (in Ukrainian).

[14] Decision of the Constitutional Court of Ukraine (CCU) dated 01.06.2021 No. 2-rp/2016. Available online at: https://zakon.rada.gov.ua/laws/show/v002p710-16#Text (accessed on 28 July 2025) (in Ukrainian).

[15] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance). *Official Journal of*

adopted to address the environmental crisis in the EU by systematically restoring degraded ecosystems, especially those having the greatest potential for carbon capture and storage, as well as for preventing and reducing the impact of natural disasters. This EU regulatory document also serves as a tool for implementing the EU's international commitments in the field of biodiversity protection enshrined in the Kunming-Montreal Global Biodiversity Framework (2022-2030). Taking into account Ukraine's strategic course towards European integration, the implementation of the relevant provisions of the envisaged Regulation should become one of the priorities of the state's environmental policy in the post-war period.

It is worth highlighting that on the eve of the full-scale invasion, particularly on 11 February 2022, the MEPNRU officially announced the beginning of the development of a State Policy Concept and the draft law in the field of conservation and restoration of ecosystem services. However, the relevant measures were never included in the Work Plan of the Ministry for 2024 (MEPNRU, 2024) nor in the Work Plan for 2025 (MEPNRU, 2025a) At the same time, within the framework of the Draft Recovery Plan of Ukraine (NCRUfCW, 2022), it is determined that the Ministry of Environment is obliged to have developed a draft Law "On Ecosystem Services" by 31 December 2025, additionally – within six months from the date of its adoption – to develop draft by-laws that will determine the list of ecosystem services, methods for their inventory and evaluation, and other mechanisms for implementing the provisions of the Law. The lack of advanced development and adoption of this legislative act, as well as mechanisms for its implementation, renders it impossible to compensate for environmental damage in full, since there is no clear methodological and legal framework for assessing loss in the field of ecosystem services. Of significance is the fact that an announcement about initiating the discussion of the draft Strategy for the formation and implementation of the state policy in the field of ecosystem services management was made on the official website of the Ministry of Environment on 13 February 2025 (MEPNRU, 2025b), though the text of the draft Law at the time of preparing this study has not yet been put up for public discussion.

Thus, assessing the scale of losses caused by the military aggression of the Russian Federation since 2014 requires priority monetization of ecosystem services and functions. Unfortunately, such an assessment was not carried out in advance, which, in turn, hinders the development of compensation mechanisms. This is particularly relevant because the LoU "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030" states that "the development of ecosystem services will create opportunities for the sustainable development of society and the ecosystem. The biological diversity of Ukraine, which provides ecosystem services, should be preserved, evaluated, and restored accordingly by 2030."[16]

the European Union. Available online at: http://data.europa.eu/eli/reg/2024/1991 (accessed on 28 July 2025).

[16] Vidomosti Verkhovnoi Rady Ukrainy (VVRU). (2019). Law of Ukraine dated 28.02. 2019 No. 2697-VIII "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030". No. 16 Art. 70. Available at: https://zakon.rada.gov.ua/laws/main/2697-VIII#Text (accessed on 28 July 2025) (in Ukrainian).

In this context, the analytical developments of public environmental organizations, prepared with the support of the EU, which have made a significant contribution to the formation of a national approach to ecosystem services, should be positively assessed. In these materials, the necessity of applying the ecosystem approach in determining and assessing damage caused to ecosystems and biodiversity is justified; a methodology for economic assessment of their cost, taking into account world practices, is proposed (Varukha, 2022). Of a peculiar importance is the results of the study conducted within the framework of the project "Together for Environmental Democracy, Justice and the Rule of Law in Ukraine" (TEDJusticeROL, 21GR3259) with the financial support of the International charitable organization "Ecology-Law-Man" and the US Government (Vasylyuk *et al.,* 2023). Within the framework of the envisaged study, the international classification of ecosystem services CICES has been adapted to Ukrainian conditions in the form of the CICES-UA model; an assessment methodology based on the inventory of natural settlements (biotopes) has been developed; a new concept of "ecosystem welfare" and a method of its quantitative measurement have been proposed. The specified works are considered to be a fundamental contribution to the meaningful characterization of ecosystem services, both from a natural, biological, and economic point of view, which will further serve as a basis for ensuring a legal form to environmental services, namely, adopting a relevant law "On Ecosystem Services." At the same time, accelerating the process of inventorying natural resources, improving the mechanisms for their accounting, as well as including the use of digital tools and geographic information systems, are necessary steps to be taken. Taking the aforementioned into account, it should be elucidated that the above statement again confirms the complexity and multicomponent mechanisms of compensating environmental damage caused both to natural resources and society as a whole due to the loss of ecosystem services and disturbance of the ecological balance.

International and European Approaches to Indemnifying Environmental Damage

Unlike the national legislation of Ukraine, the concept of "environmental damage" has a clear normative consolidation both in international law and the law of the EU, which is explicitly defined in the Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment[17] of 21 June 1993 as well as in Directive 2004/35/EC[18] of the European Parliament and of the Council on environmental liability about the prevention and remedying of environmental damage of 21 April 2004. US legislation, particularly the CERCLA,[19] has also had a significant impact on the formation of international approaches to determining and compensating for environmental damage. The regarded normative act introduced the concept of "natural

[17] Council of Europe (1993). Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment of 21 June 1993. *Lugano,* ETS No. 150. Available online at: https://tinyurl.com/ytedn34a (accessed on 25 July 2025).

[18] Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. *Official Journal of the European Union*, L 143, 56-75. Available online at: https://eur-lex.europa.eu/eli/dir/2004/35/oj/eng (accessed on 25 July 2025).

[19] 42 USC Ch. 103: Comprehensive Environmental Response, Compensation, and Liability: Act (CERCLA). Available online at: https://uscode.house.gov/view.xhtml?path=/prelim@title42/chapter103&edition=prelim (Accessed: 01 June 2025).

resources" as an object of harm into the legal field in addition to consolidating the principle of restoring the damaged environment to its basic (pre-emergency) state. The UNCC, established to consider claims for damages caused as a result of Iraq's invasion of Kuwait (1990-1991), also referred to the CERCLA provision (UNCC, 2022a; b), defined environmental damage not only as the physical destruction of natural objects, but also as the loss or deterioration of ecosystem services they provided. To elucidate, in individual decisions, the Commission has made it clear that appropriate compensation should include the costs of environmental remediation to the state that would have existed if the incident had not occurred – i.e., to a basic state, rather than a functionally limited one. To exemplify, in the Kuwait case, the UNCC recognized reasonable costs for the reclamation of coastal mangroves destroyed by oil spills as well as for long-term environmental studies to monitor ecosystem restoration.

From a practical point of view, the implementation of such approaches is impossible without applying appropriate international harm assessment methodologies, a significant role in which is played by. International Valuation Standards (IVS 2022) (USAID, 2022), along with comparative standards and methodologies for assessing the environment, ecosystems, and protected natural resources developed under the auspices of the UN, the EU, USAID, and other organizations. The enlisted documents allow taking into account not only direct material lesions, but also the cost of disturbed ecosystem functions, loss of biodiversity, reduced landscape stability, and other long-term consequences. This approach is exceedingly important for modern international environmental practice since it shows that ecosystem services are a full-fledged object of compensation, and not just an additional criterion for assessing losses. Accordingly, the UNCC practice can be adapted to substantiate mechanisms of compensating damage caused to the environment of Ukraine as a result of armed aggression.

In contrast to the approach, enshrined in international documents and UNCC practice, Ukrainian legislation is currently operating under a somewhat simplified category – "reproduction of natural resources to a state suitable for their intended use," the formulation of which leaves open and debatable the following question what peculiarly is meant by "intended use of natural resources" – only economic use or also their ecosystem services. Apparently, national legislation lacks an effective legal mechanism for assessing ecosystem services, in terms of their identification, methods, and criteria for assessing losses. At the same time, the positive aspect is that some lesions related to natural resources are already included in the field of legal regulation. Thus, in accordance with the Procedure for determining damage and harm caused to Ukraine as a result of the armed aggression of the Russian Federation, approved by Resolution of the CMU No. 326[20] of 20 March 2022, the main indicators for assessing damage caused to natural resources attribute the following: subsoil harmful consequence, land reclamation costs, restoration of land reclamation systems, and forest fund detriment.

Particular attention is drawn to the category of forestry production losses, to determine which, during martial law, the Procedure for determining loss of forestry production was

[20] Resolution of the Cabinet of Ministers of Ukraine (CMU) dated 20.03.2022 No. 326 "On the Approval of the Procedure for Determining the Damage and Losses Caused to Ukraine as a Result of the Armed Aggression of the Russian Federation." (2022b). Available online at: https://zakon.rada.gov.ua/laws/show/326-2022-п (accessed on 28 July 2025) (in Ukrainian).

adopted, approved by Resolution of the CMU No. 588[21] of 9 June 2023. According to this document, the specified include: damage of forest land and shrubs as well as those caused by restrictions in land use and deterioration of land quality (P. 1 of Art. 207 of the CCU), which are indemnified regardless of compensating harmful consequences to land owners and land users (P. 4 of Art. 207 of the CCU). Calculating the amount of forestry production detriment is carried out based on loss standards for the ARC, regions, the cities of Kiev and Sevastopol due to the formula in accordance with such indicators as: area of forest land and withdrawn shrubs plot; standard of forestry production losses; quality index of forest land and shrubs plot; coefficient of forest lands and shrubs productivity by types of forest-growing conditions. However, it should be noted that the lesions of other natural resource farms – in particular, hunting, water, fishing, etc. – remain out of the legal regulation, which, in turn, reproduces the general practice of previous years, when the former was calculated mainly for agricultural and forest production, without taking into account the broader ecosystem approach.

In the context of armed aggression by the Russian Federation, for the period from 24 February 2022 to 24 February 2023, the Government of Ukraine together with the World Bank Group, the European Commission, and the UN estimated the cost of reconstruction and rehabilitation of Ukraine, according to which the total need for financing is $ 411 bn (equivalent to 383 bn euros (€), while damage caused to the environment and forestry is evaluated at approximately $ 2 bn (UNU, 2023). At the same time, according to the updated data of the fourth assessment of needs for recovery and development of Ukraine (RDNA4), the total amount of needs increased to $ 524 bn (equivalent to € 506 bn) (UNDP, 2025). Meanwhile, due to the official information of the MEPNRU, merely losses caused to the environment are assessed at more than € 108 bn as of 2025 (MEPNRU, 2025c). The above calculations are based on the general "Procedure for determining damage and lesion caused to Ukraine as a result of the armed aggression by the Russian Federation," approved by Resolution of the CMU No. 326[22] of 20 March 2022, constantly updated and improved, given which appropriate methods for natural resource areas are developed such as: (a) *damage caused to land resources* – a direction, which includes harm from damaging and destructing topsoil and that caused by polluting and clogging land resources; b) *loss of subsoil* – a direction that involves the loss of subsoil caused by unauthorized their use; (c) *damage caused to water* – a direction, which inscribes pollution, contamination, depletion and other actions in water, which may worsen the conditions of supply, harm human health, cause shortening in fish stocks and other objects of fishing industry, deterioration of the living conditions of wild animals, decrease in soil fertility and other adverse phenomena due to changes in physical and chemical properties of water, hence, reducing their capacity for natural purification and violating hydrological and hydrogeological regime of waters; d) *damage caused to atmospheric air* – a direction that includes damage caused by emitting pollutants in atmospheric air; (e) *loss of forest fund* – a direction, which involves loss

[21] Resolution of the Cabinet of Ministers of Ukraine (CMU) dated 09.06.2023 No. 588 "On Approval of the Procedure for Determining Losses of Forestry Production." (2023). Available online at: https://zakon.rada.gov.ua/laws/show/588-2023-%D0%BF#Text (accessed on 01 June 2025) (in Ukrainian).

[22] Resolution of the Cabinet of Ministers of Ukraine (CMU) dated 20.03.2022 No. 326 "On the Approval of the Procedure for Determining the Damage and Losses Caused to Ukraine as a Result of the Armed Aggression of the Russian Federation." (2022b). Available online at: https://zakon.rada.gov.ua/laws/show/326-2022-п (accessed on 28 July 2025) (in Ukrainian).

and damage to forests and forest land, and other related expenses; (f) *damages caused to the natural reserve fund* – a direction, which inscribes damage inflicted on the territories and objects of natural reserve fund and other related expenses; (g) *damages caused to water resources* – a the direction that includes pollution, clogging, depletion and other actions in relation to water resources that may worsen the conditions of water supply, harm human health, lead to a decrease in fish stocks and other objects of water fishing, deterioration of the living conditions of wild animals, decrease in soil fertility and other adverse phenomena due to changes in the physical and chemical properties of water, further lessening their ability for natural purification in addition to infringing hydrological and hydrogeological regime of waters. Thus, despite attempts to systematize the directions of fixing damage in the relevant regulatory documents, in practice, the classical approach to defining detriments still dominates through that to property, bodily injuries, and direct economic loss. At the same time, the loss of ecosystem functions and services, regardless of its strategic importance, is not always properly reflected in the financial indicators of losses.

Consequently, when comparing the above two approaches to assessing total environmental damage, there is a significant difference in methodology and scope. At first glance, the national assessment of damages and losses may be somewhat overstated; however, it is worth considering the thing that a full restoration of ecosystems requires considerable time. At the same time, the very possibility of such restoration remains questionable; effective forecasting of measures for environmental "rehabilitation" in current conditions of full-scale aggression is extremely complicated in view of the fact that environmental damage is inflicted daily, and the scale of destruction has a cumulative effect. In addition, analysing the names of the relevant areas in accordance with the procedure approved by Resolution of the CMU No. 326[23] of 20 March 2022 indicates that natural resources, i.e., economically significant natural resource potential, and not elements of the environment or components of natural ecosystems are mainly addressed. In this context, damage to natural resources rather than natural objects in the sense of an ecosystem whole is considered, which, in turn, leads to the following question of whether certain elements of the environment, in particular atmospheric air or subsoil (the terminology used in accordance with the directions of the above-mentioned Resolution), are subject to reproduction (restoration). It is well known that, according to national legislation, atmospheric air is regarded as a conditionally reproducible natural resource and object of ecological and legal protection, whereas subsoil resources are envisaged as an exhaustively non-renewable resource.[24] Therefore, it may be more about improving the quality characteristics of atmospheric air, but not about fully restoring the subsoil as a natural resource. Given this, it seems promising and expedient to apply the category of "fund" for legal regulation of compensating damages, expenses, and detriments caused, specifically to the forest fund and nature reserve fund, since the suggested approach is complex and allows integrating ecosystem functions into the loss accounting system.

It should be noted that the specified Resolution does not practically contain indicators related to indemnifying expenses for restoring ecosystem services and functions, hence,

[23] Ibid.
[24] *See* the LoU "On Atmospheric Air Protection."

completely neglecting the category of climate resources, despite their significance in international environmental law. In this regard, at the legislative level, it is worth ensuring a clear definition of the list of standard environmental services provided by ecosystems and natural resources, in addition to developing certain plans to restore natural ecosystems, taking into account the typology of ecosystems, the degree of their degradation, loss of biodiversity, and adaptation to climate change.

Returning to the analysis of the legal category of "ecological damage," it is worth paying attention to the specifics of its definition in the law of the EU. Thus, in the text of the European Parliament and of the Council of 21 April 2004 "On Environmental Responsibility for the Prevention and Elimination of Consequences of Damage Caused to the Environment" (hereunder the Directive), para. 1 of P. 1 of Art. 2 ("Definition") traces the use of several legal constructions of the same concept, united by a combination, which de facto forms a synonym series. On the other hand, there is no clear distinction between the definitions of "damage caused to the environment" and "environmental damage." In our opinion, the second formulation is key from the point of view of modern European environmental doctrine: "negative measurable changes in natural resources or disruptions of natural resource-related that may or may not occur directly," which allows considering harmful consequences not only due to the physical destruction of environmental elements, but also due to measurable lesion in the functionality of the natural environment, in particular its ecosystem services. In this context, the commitment to restore ecosystems, natural resources, environmental services, and functions should be given the status of an environmental imperative. Based on the above, it should be stated that the domestic approach to the legislative definition does not meet the EU requirements, as has been repeatedly noted, environmental damage should be regarded not only because of losses and harm caused as a result of infringing environmental legislation.

At the same time, this problem is not only terminological, but also much deeper, since it is related to doctrinal and regulatory approaches to the definition of the category of "environmental safety" at the national level. Of necessity is necessary to rethink the envisaged concept, which is extremely relevant in the context of European integration processes, particularly in terms of harmonization with the approaches enshrined in the law of the EU. A modern interpretation of environmental safety should be based not only on preventing environmental legislation violations or eliminating their consequences, but also on introducing a systematic approach to managing risks that threaten ecosystems, natural resources, and ecosystem services. To specify, environmental damage should be defined as measurable negative changes in the state of the environment, including the loss or deterioration of ecosystem services and functions, provided by natural resources and their components. The mentioned approach is already being implemented in EU and US legislation, where environmental harm is viewed through the prism of observational or quantified changes that are of a long-term or irreversible nature.

Taking the above into account, the national model of environmental safety should be upgraded by introducing a hazard-based approach to ecological management, providing for a balance between supposed losses and expected benefits as well as a systematic assessment of environmental impacts, an important step in which is to review the

established scientific and regulatory approaches to the legal nature of the concept of "environmental risk" in the system of ensuring national security. Ecological perils should be interpreted as apprehended, probable or potentially possible dangerous consequences of man-made, natural or anthropogenic nature for the environment or its element, which include serious or irreversible impacts on human life and health, natural resource potential, climate, biodiversity, landscape complexes, ecosystem services, and even near-Earth space; and assessed, considering the vulnerability and resilience of ecosystems to environmental threats.

In this context, environmental safety should be regarded in a broad sense, covering not only *'classical'* natural resources such as atmospheric air, water, soil, wild fauna and flora, etc. (any, as specified in the European directives, that "grow, bloom and live"), but also habitats in addition to ecosystem services granted by natural resources and complexes as well as their functions. In this regard, it is worth attempting to elaborate a definition of "environmental safety," which will be based on the legal construction of "ecological perils," developed based on the ecosystem approach and the concept of "Planetary Boundaries." This concept allows taking into account the limits of ecological stability of the biosphere, violating which increases the risk of irreversible changes in global ecosystems. To highlight, the entire system of legal support for environmental safety should be aimed at preventing, lowering, or neutralizing environmental hazards to a level acceptable given the socio-economic state of the country, its technical capabilities, and international obligations. For this purpose, of critical to ensure early identification of potential ecological perils, particularly for public health, to establish priorities for environmental recovery, climate change adaptation, and implementation of green reconstruction strategies.

It should be noted that the UN Regional Office for Disaster Risk Reduction (UNISDR) has been contributing to Ukraine for a long time when implementing the provisions of the Sendai Framework for Disaster Risk Reduction for 2015-2030 (UNDRR, 2015). The Document is a continuation of the Hyogo Framework Programme, referring to acts of soft law acts, i.e., not having a binding legal status, though recognized as an essential reference point for national policy. Within the Sendai programme, the concepts of "Build Back Better" and "antifragility," ensuring not just restoration, but acquisition of new systems of the highest quality and sustainability, were assigned for the first time. The current national legislation, as a rule, establishes norms for regulating relations on the so-called priority restoration of natural resources. At the same time, in the long run, the strategic priority should be not only technical or material restoration, but also ecosystem rehabilitation – adaptation to climate change, maintaining environmental sustainability, restoring landscape and biological diversity, as well as providing for the physical and mental health of populations affected by armed conflict. In this regard, a peculiar attention should be paid to the EU Regulation 2024/1991[25] on nature restoration, adopted as part of implementing the EU Strategy on Biodiversity,[26] being a key element of the

[25] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance). *Official Journal of the European Union.* Available online at: http://data.europa.eu/eli/reg/2024/1991 (accessed on 28 July 2025).

[26] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance). *Official Journal of*

envisaged Strategy. The Regulation stipulates that "biodiversity shall be valued, preserved, restored and reasonably used, thus, maintaining ecosystem services, supporting a healthy planet and granting benefits all people need." As can be seen, the emphasis is placed on restoring ecosystem functions and services, elucidating "the need to ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems together with their services, in particular forests, wetlands, mountains and drylands" (UNDRR, 2015). Therefore, it is reckoned that when assessing the environmental damage caused to ecosystems, of necessity is necessary to regard non-received benefits from environmental services provision. It should not be only about the economic cost of these services, but also spending on their restoration and the so-called "rehabilitation" (conservation) of ecosystems. In case of Ukraine, undergoing devastating effects of military aggression, the envisaged issue becomes exceptionally acute, first and foremost, due to the need for humanitarian demining of large areas; safe handling of toxic and explosive waste; overcoming consequences of destroying industrial facilities; polluting water resources and soil; additionally, problems of granting chemical, biological and radiation safety are particularly relevant. Consequently, it is expedient to introduce an integrated approach in national environmental policy that considers both the impact on the environment and the ability of ecosystems to restore and ensure viability for current and future generations.

Therefore, understanding the irreversibility and necessity of europeanization of national legislation in the field of environmental protection – as one of the key prerequisites for Ukraine's acquiring its membership the EU – it is worth focusing on the provisions of Directive 2004/35/EC[27], according to Art. 2 of which, environmental damage is divided into the following three main categories: (a) that to protected species and natural settlements; (b) that to the aquatic environment; (c) that to soils posing a significant risk to human health. As for the third type – the so-called "net ecological detriment," it should be noted that the specified implies not only soil degradation, but also perils of "considerable negative consequences for human health from direct or indirect penetration of substances, drugs, organisms or micro-organisms into the surface or soil" (Ibid.). In this context, the European Commission's document – Commission notice guidelines providing a common understanding of the term "environmental damage" as defined in Article 2 of Directive 2004/35/EC[28] of the European Parliament and of the Council on environmental liability concerning preventing and remedying environmental damage is of importance (EC, 2021) in view of the fact that the former highlights the key role of assuring causal relationship between illegal actions (or inactions) of a potential offender and the harm caused. According to these Guidelines, the judicial authorities should conduct an objective comparison of evidence adduced by both the plaintiff and the defendant, which is consistent with the general principles of fair

the European Union. Available online at: http://data.europa.eu/eli/reg/2024/1991 (accessed on 28 July 2025).

27 Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. *Official Journal of the European Union*, L 143, 56-75. Available online at: https://eur-lex.europa.eu/eli/dir/2004/35/oj/eng (accessed on 25 July 2025).

28 Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. *Official Journal of the European Union*, L 143, 56-75. Available online at: https://eur-lex.europa.eu/eli/dir/2004/35/oj/eng (accessed on 25 July 2025).

consideration of cases in the field of environmental justice. Given the above, the national model for determining ecological degradation needs to be significantly updated not only in terms of terminology, but also of procedural and evidentiary scope, taking into account the EU standards.

In the context of the aforementioned, it should be elucidated that in international practice, there are frequent examples of considering cases for damage compensation caused as a result of hostilities or illegal actions of states in various scopes, such as international criminal law, international environmental law, humanitarian law, etc. However, a unified approach to calculating the lesion has not yet been established at the international level, since material damage and compensation are usually assessed on a case-by-case basis. To exemplify, in the case "Certain Activities Carried out by Nicaragua in the Border Area *(Costa Rica v. Nicaragua)*" (2010)[29], Costa Rica claimed compensation for environmental damage (ecosystem goods and services as well as the costs of their restoration included) along with direct costs and expenses incurred as a result of Nicaragua's illegal activities (to precise, in connection with monitoring, purchasing expert reports, etc.). It should be noted that Costa Rica claimed indemnification for six types of goods and services for fifty years (i.e., a timescale needed to restore the damaged territory) using a 4% discount rate of $ 2,880,745.82. Of particular interest is the approach of the countries and the ICJ to determining the amount of environmental damage. As is known, the key principles of evaluating ecosystem services are developed in detail within the framework of the project "Economics of Ecosystems and Biodiversity (EEB)" (EC, 2024), the Rio Convention (UN, 1992). Hence, Costa Rica applied the "ecosystem services approach," since the latter allows for considering total and potentially long-term environmental damage. Instead, Nicaragua insisted on Costa Rica being entitled to compensation according to the "replacement cost of ecosystem services" principle, based on the fact that the mentioned was one of the methodologies used by the UNCC (in the Case of the illegal invasion and occupation of Kuwait by Iraq in 1990, 1991 (enshrined in Resolution (UN) of the Security Council No. 687 of 3 April 1991 on the situation between Iraq and Kuwait). It should be emphasized that this method calculates the cost of maintaining an equivalent area for the affected area until the services provided for the latter are restored. At the same time, the ICJ has taken a comprehensive approach to the outlined issue, approaching the definition of environmental damage from the point of view of the ecosystem as a whole and assessing the overall distribution and loss of environmental services along with goods before their restoration.

In the Case of "Armed Actions in the Territory of the Congo *(Democratic Republic of the Congo v. Uganda)*" (96 1999)[30], the regarded country calculated the lesion caused to the following *three main natural resources:* minerals (including gold, diamonds, coltan, tungsten, and tin); flora (involving timber, coffee as well as compensating damage caused by deforestation), and fauna (in the nature reserve of Okapi Wildlife Sanctuary and Virunga National Park) for $ 3,478,494.205 (at the initial stages of the trial with its further clarification). However, after conducting oral proceedings in April 2021 and on

[29] Case, *Costa Rica v. Nicaragua.* (2010). Available online at: https://www.icj-cij.org/en/case/150 (accessed on 01 June 2025).

[30] Case, *Democratic Republic of the Congo v. Uganda.* (1999). Available online at: https://www.icj-cij.org/en/case/116 (accessed on 01 June 2025).

9 February 2022, the ICJ issued a decision to compensate $ 225 mln for harm to persons, $ 40 mln for destruction to property, and $ 60 mln for detriment related to natural resources. It should be elucidated that the EU approach forms a new paradigm of legal response to environmental damage, which goes beyond traditional compensation for material losses, focusing on the restoration of natural functions, ecosystem services, and natural processes. However, when adapting this approach to national legislation, best practices of Ukrainian environmental and legal science, which substantiate the chain effect of ecological degradation, from infringing the state of certain natural resources to threatening the life and health of citizens, should be taken into account.

Modern challenges require Ukrainian scientists and legislators to reconsider and normalize such key issues as determining the harm caused to protected natural areas; legally fixing the concepts of "favourable state of conservation", "initial state", "environmental services", and "ecosystem functions". The recent legislative consolidation of the concept of "environmental damage" within Ukraine's legal framework is highly pertinent. It emphasizes not only the detriment to natural resources—including biodiversity, habitats, soils, and water—but also the disruption of interconnections among these resources and the consequent loss of ecosystem services. Particularly, it highlights the impacts where one natural resource is sacrificed for the benefit of another or society as a whole.

Key considerations include: who receives compensation for ecological degradation; the specific environmental and renewable initiatives funded; assurances regarding the intended use of these funds and the mechanisms in place to ensure this; and the establishment of control measures to mitigate risks of misuse and corruption. As seen, the issue of effective management of environmental compensation should be an integral part of the policy of environmental security and post-war reconstruction of Ukraine. It is obvious that the environmental and climatic damage caused as a result of the full-scale aggression of the Russian Federation is systemic, long-term, and irreversible, and should not be disregarded by the international community, even after the cessation of hostilities, but rather be subject to long-term monitoring, political liability, and legal response. In this regard, the experience of the UNCC is also noteworthy, particularly Decision No. 7 of the Board of Governors of the Compensation Commission[31] of 16-20 March 1992 (UNCC, 1992; Sand, 2005), which defines *the main types of environmental damage to be compensated:*

a) reduction and prevention of the specified, including costs directly related to extinguishing oil and stopping oil flows in coastal and international waters;
b) grounded measures taken to clean up and restore the environment, or future ones to be documented as reasonably necessary for its cleaning up and restoring;
c) proper observation and assessment of the regarded damage to evaluate and lessen harm, as well as restore the environment;
d) substantiated monitoring of public health and conducting medical examinations to investigate and combat increased health risks due to ecological detriment;

[31] Decision (UN) No. 7 of the Governing Council of the Compensation Commission of 16-20 March 1992 during its third session, at the 18th meeting, held on 28 November 191, as revised at the 24th meeting held 16 Match 1992. S/AC.26/1991/7/Rev.1 of 17 March 1992. Available online at: https://tinyurl.com/mvs2axj6 (accessed on 02 June 2025).

e) depletion of natural resources or damage caused by the latter.

These provisions can be addressed as a reference when forming the Ukrainian system of environmental damage compensation, which will meet both European legal standards and global expectations in the field of sustainable development, post-conflict recovery, and environmental justice.

Conclusions

Based on the analysis of national legislation, judicial practice, and norms of international environmental law in the field of armed conflict, it has been proven that there are gaps in the field of compensating damages caused to the environment, as well as a lack of a unified approach to assessing their size. The study substantiates suggestions on the expediency of developing and implementing new conceptual approaches to forming a modern legal doctrine of indemnifying ecological and further climate detriment, which will become the basis for improving national legislation, optimizing the vision of national environmental policy under martial law. Taking the above considerations into account, the following conclusions and generalizations can be made: first, it is proved that ecological degradation should be regarded as a multi-level phenomenon based on the synergy of knowledge of natural, humanitarian and exact sciences in view of the fact that the specified (in the sense of multi-level construction of a legal category) is characterized as a generic concept, having a complex character, extrapolating the relevant types of lesion and harm, losses caused to natural resources and complexes, nature conservation areas, ecosystem services and functions as well as the life and health of citizens in addition to boosting their vulnerability for many decades, perhaps even centuries.

Secondly, as a result of causing environmental damage, not only economic and social losses occur, but also ecosystems stability is disrupted (in some cases, it implies their destruction), which, in turn, leads to losing biological and landscape diversity, destroying life-supporting chains. Therefore, due to the anthropocentric nature of the ecological school, it is worth taking into account the thing that perilous, irreversible, long-term, serious changes in the state of the environment significantly affect the life and health of citizens, the health of the nation, and future generations of Ukrainians. Moreover, the issues of preserving the gene pool of the Ukrainian people remain insufficiently resolved. It is also substantiated that by the nature of damage, it is reasonable to consider ecological disruption as direct (imminent), while harm to life and health, the gene pool of the Ukrainians, as indirect (circumstantial).

Thirdly, it is determined that environmental damage is inherent in the compensatory legal relations in the security and protection sphere, formed based on ecosystem and climate-oriented approaches. Fourthly, it is argued that in order to fully comprehend the investigated legal category of ecological degradation, obligations to restore ecosystems, natural resources, environmental services, and functions shall become a strict and indisputable environmental imperative. Fifthly, when calculating the envisaged lesion, it should be regarded as the cost-recovery approach to assessing natural resources along with detrimental changes in their condition (as well as further risks and threats from dangerous factors, phenomena) and deterioration of the quality of environmental services and functions to restore the latter to their basic state that existed before the

military impact. Sixthly, it is stated that environmental damage is considered as observational or measurable harm to the environment and/ or corresponding measurable losses of ecosystem services and even functions, etc.

Recommendations

Based on the above, it is believed that at the legislative level, clear mechanisms for the legal provision of environmental damage compensation should be promoted. It is worth adopting a peculiar law dedicated to the mentioned issues, namely that "On Environmental Services" or "On the Preservation of Environmental Services." Alternatively, to accelerate the rule-making process, as a first step, it is possible to make appropriate amendments to the existing Law of Ukraine "On Environmental Protection" in compliance with international obligations (to provide for a section on ecosystem services and functions or to develop a separate special law on the specified). Consequently, of necessity is necessary to define the main categories of ecosystem services, the procedure and criteria for their assessment at the legislative level; from which point of view, it is expedient to reflect on climate and environmental criteria for restoration as cross-cutting vectors of state policy. The issue of developing and adopting a methodology for calculating ecosystem services as a really estimate of ecological disruption has been prioritised for ages. The problem of implementing a standardized typology of ecosystem services in the practice of strategic planning based on the European model is also relevant. In addition, a strategy for the formation and implementation of state policy in the field of ecosystem services management has been submitted for public discussion by the Ministry of Environment, which undoubtedly will be of a cross-sectoral significance for national policy, further introduced into national legislation, hence contributing to high-quality management and the formation of the state's institutional capacity to preserve natural capital.

Lawyers should also focus on improving and optimizing the formation of the international register of losses as part of the Global Compensation Mechanism for determining a special environmental sub-register in their composition, which, in turn, should be the subject of further scientific research.

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Authors' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*	*Author 4*	*Author 5*
Conceived and designed the research or analysis	Yes	No	No	Yes	Yes
Collected the data	Yes	Yes	No	No	No
Contributed to data analysis and interpretation	Yes	Yes	Yes	Yes	Yes
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